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Mr. Steve Church, Research Division
California Air Resources Board
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Gentlemen:

Early action program and ETAAC (Agricultural Sector) tout Anaerobic Digestion (AD) as an environmentally beneficial process. Throughout the ETAAC report AD is promoted. The opposite may very well be the case.

Anaerobic digestion converts organic matter to methane, CO2, H2S, and ammonia gases. Methane can be captured and burned to reduce GHG emissions. However, the ammonia emissions will increase due to increased anaerobic efficiencies in enclosed anaerobic digesters.

Today, ammonia is the major contributor to fine particulate matter (<PM2.5) in the SJ Valley, resulting in the violation of federal and state air quality regulations. Increased use of, and efficiency of, AD will result in greater ammonia emissions further aggravating the very unhealthy air quality conditions. Increased use of AD will occur by encouraging the abandonment of aerobic manure handling practices. AD efficiencies will increase through the installation of covered digesters that will provide more complete conversion of nitrogenous compounds to ammonia.

Furthermore ammonia emission to the atmosphere from anaerobic effluent will ultimately precipitate, undergo nitrification and denitrification, resulting in the release of N2O a powerful GHG to the atmosphere; perhaps eliminating any gain achieved from the combustion of methane.

Some have argued that existing open lagoons cause greater ammonia emissions when compared to enclosed digesters since: 1) The lagoons are completely anaerobic. 2) The pH is higher in the lagoons because of the lower partial pressure of CO2, 3) The higher pH will result in greater concentrations of ammonia gas (NH3) verses ionized ammonia (NH4+),

and 4) the open lagoon provides a large surface area or interface for the volatilization of ammonia.

On the other side of the coin the following argument can be made: 1) Open lagoons are not completely anaerobic resulting in lower hydrolysis rates of organic matter. A completely enclosed digester is strictly anaerobic and therefore should be expected to convert a greater percentage of the organic nitrogen to ammonia. 2) The pH in an enclosed digester rarely exceeds 7.3± because of the high partial pressure of CO2. 3) A lower pH will cause in a lower concentration of gaseous (NH3) ammonia and a higher concentration of ionized ammonia thus retaining the ammonia in solution. However, upon discharge from the digester the effluent CO2 partial pressure drops from 40%± to 3%± causing a pH increase resulting in the conversion of ionized ammonia to gaseous ammonia. 4) The air water interface created through effluent irrigation or recycle flushing is significantly greater than the lagoon surface area, providing sufficient interfacial area for the complete volatilization of gaseous ammonia at an elevated pH.

Therefore any increase in anaerobic digestion use or efficiency (percent of organic N converted to ammonia) will cause an increase in atmospheric ammonia and result in significant adverse health effects.

Any use of AD must be accompanied by methods to limit ammonia discharge. Honest data should be acquired to establish the conversion of organic nitrogen to ammonia in anaerobic digesters vs. open lagoons. Manure handling technologies must reduce the high ammonia concentrations in the SJ Valley such that air quality standards can be achieved. The existing situation should not be aggravated or maintained.

Sincerely,

Dennis Burke PE